We have not studied the matter sufficiently to hazard an explanation. The simplest working hypothesis would be that the difference observed is an expression of the greater reducing activity of the unfertilized eggs. It may be imagined, however, that the iodine is disposed of in the unfertilized eggs by the lipoids of the plasma membrane. In the fertilized eggs these lipoids may be redistributed or otherwise changed in the membrane, and this change in the lipoids may lead to the increase in permeability to certain substances. This supposition would tend to bring our iodine experiments into relation with the other observations on permeability.

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A PECULIAR HEAT PHENOMENON

THE phenomenon described here was discovered unexpectedly in connection with a lecture experiment on vapor pressure. An inverted barometer tube *A* is arranged so that the space above the mercury is filled with water and water vapor. A glass tube *B* surrounds the barometer and allows steam to enter at the top, surround the barometer, and pass out at the bottom. As the vapor is warmed by the steam, it increases in pressure and pushes the mercury down.

The incoming steam does not pass immediately through the tube, but works its way gradually downward, its progress being noted by the condensation on *B*. The mercury column follows the condensed steam line regularly until it is depressed about 12 cm., when it begins to oscillate. Thus, if *B* represents the lower end of the condensed steam, the oscillations take place symmetrically on either side of *B* between *E* and *F*, the distance *EF* being from 2 to 4 cm. In the meantime, the steam line progresses steadily downward; the oscillations following it closely and becoming more rapid and of less amplitude until they finally cease near the bottom of the tube.

The action is a close approach to that of a Carnot's engine. The substance goes through a complete cycle during each oscillation, absorbing heat at steam temperature and giving it out to the cold tube below *B*. It becomes cooled also by the work it does in expanding. It is then pushed back up the tube from below,

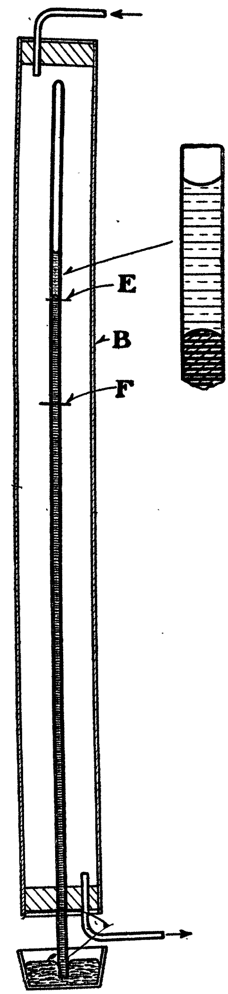

FIG. 1

its pressure being less than when expanding because its temperature is less. Therefore more work is done during expansion than contraction. The indicator diagram is probably of the form shown in Fig. 2.

The oscillations of the mercury column would tend to stop when the tube below *B* be-

comes warmed to steam temperature; but as the mercury is being pushed steadily downward where the tube is still cold, the oscillations continue. Inasmuch as the center of gravity

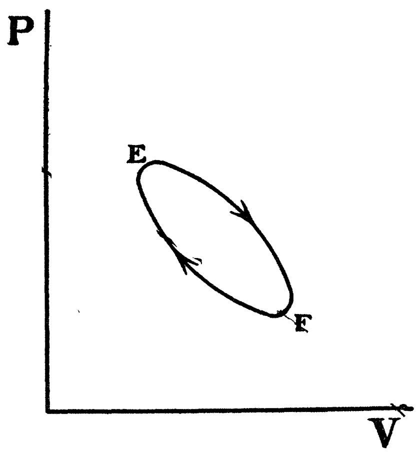

Fig. 2

of the mercury is not permanently changed during one oscillation, the only work done is that against friction. Energy must be supplied to maintain this motion.

The explanation given here is the one advanced by Griffiths[1] to explain a similar phenomenon where a bulb of air was connected to one end of a U-tube partly filled with mercury. On heating the bulb with a gas flame the mercury oscillated. Griffiths pointed out that it would be useless to compare the quantities of heat received and rejected, because the expansive substance is constantly in contact with conducting bodies at different temperatures. He stated also that the action of hot-air engines is of the same nature as the one described; a prediction that was verified by Webster[2] who, by means of an ingenious device on a small hot-air engine, projected its indicator diagram on a screen in a lecture room. The diagram was of the form shown in Fig. 2.

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May 19, 1910

[1] E. H. Griffiths, "The Thermal Measurement of Energy," pp. 49–52, Cambridge Press, 1901.

[2] A. G. Webster, "A Hot Air Engine Indicator Diagram," *Phys. Rev.*, 30, 264, No. 38.

MICROSEISMS

Ever since sensitive earthquake instruments have been built, it has been found that outside of earthquakes, which show characteristics in their records peculiar to themselves, there are other disturbances recorded; disturbances that manifest themselves by their continuity, extending over hours, days and even weeks. They appear as small pulsations, the undisturbed trace of the seismogram being converted to a finely serrated line. The amplitudes may gradually increase to a millimeter or even more on our instrument, and then disappear again. In general they are far more prevalent during the winter season than in the summer. These pulsations or tremors I call microseisms. The question naturally arises, what produces these vibrations? Are they due to a constant stress in the earth's crust which at times adjusts itself by a rupture along some weak line, along a fault, or are they produced by thermometric or barometric conditions of the atmosphere. Among phenomena of the latter we may consider winds, and the position and movements of the area of low barometer.

A very superficial examination of the facts eliminates the temperature effect, that is, the varying heat from day to day.

For the barometric conditions of the atmosphere there was available at the observatory the record of the Shaw microbarograph and also the Canadian daily weather maps. The microbarograph has a magnification of 20, so that rapid fluctuations in pressure are very well shown, as shown by local strong winds. The daily weather maps show the position of the isobars from the Pacific to Newfoundland in the Atlantic, with differences of pressure of 0.1 inch for adjoining isobars.

The seismograms are the records of two Bosch photographic horizontal pendulums mounted N.–S., E.–W., respectively, on a concrete pier free from the cement floor in the basement of the observatory. The theoretical magnification of the record is 120 and the pendulums have air-damping. The periods of the pendulum are adjustable and lie generally between 6 and 10 seconds. The time-scale on